Requested Patent: GB2298229A

Title: A LOCK ;

Abstracted Patent: GB2298229 ;

Publication Date: 1996-08-28 ;

Inventor(s): JONES DAVID WILLIAM ;

Applicant(s): VALEO SECURITY SYSTEMS LTD (GB) ;

Application Number: GB19950003606 19950223 ;

Priority Number(s): GB19950003606 19950223 ;

IPC Classification: E05B17/04; B60R25/02 ;

Equivalents: ;

ABSTRACT:

A lock which comprises an axially displaceable locking bolt 2, a lock barrel 5 which receives an operating key, a cam unit 3 which is rotationally coupled to the lock barrel and operable so as to displace the locking bolt between a retracted and an extended (as shown) position, and an anti-shock retraction member 14 operable to engage the locking bolt to prevent the forced displacement of the locking bolt in the direction of retraction, said member being operably coupled to the lock barrel. The lock is particularly for the steering column of a vehicle.

(12) UK Patent Application (19) GB (11) 2 298 229 (13) A

(43) Date of A Publication 28.08.1996

(21) Application No 9503606.7

(22) Date of Filing 23.02.1995

(71) Applicant(s)
Valeo Security Systems Limited

(Incorporated in the United Kingdom)

Woodgate Business Park, Clapgate Lane,
BIRMINGHAM, B32 3DB, United Kingdom

(72) Inventor(s)
David William Jones

(74) Agent and/or Address for Service
Page White & Farrer
54 Doughty Street, LONDON, WC1N 2LS,
United Kingdom

(51) INT CL^6
E05B 17/04 // B60R 25/02

(52) UK CL (Edition O)
E2A AARQ A100 A115 A160 A404 A509

(56) Documents Cited
GB 1373899 A

(58) Field of Search
UK CL (Edition O) **B7J J101E2C, E2A AARQ ABM**
ACCB
Online:WPI

(54) A lock

(57) A lock which comprises an axially displaceable locking bolt 2, a lock barrel 5 which receives an operating key, a cam unit 3 which is rotationally coupled to the lock barrel and operable so as to displace the locking bolt between a retracted and an extended (as shown) position, and an anti-shock retraction member 14 operable to engage the locking bolt to prevent the forced displacement of the locking bolt in the direction of retraction, said member being operably coupled to the lock barrel. The lock is particularly for the steering column of a vehicle.

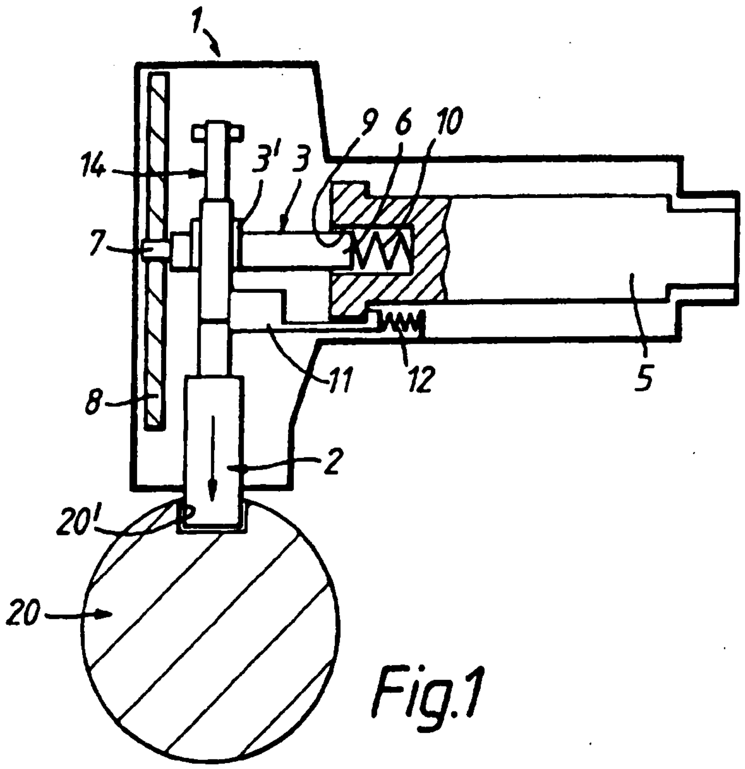

Fig.1

GB 2 298 229 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

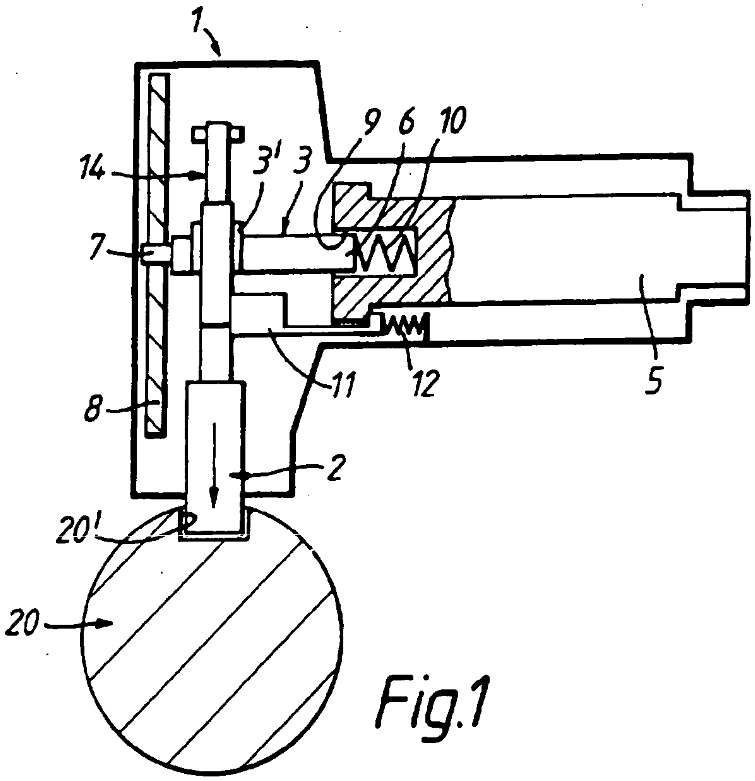

Fig.1

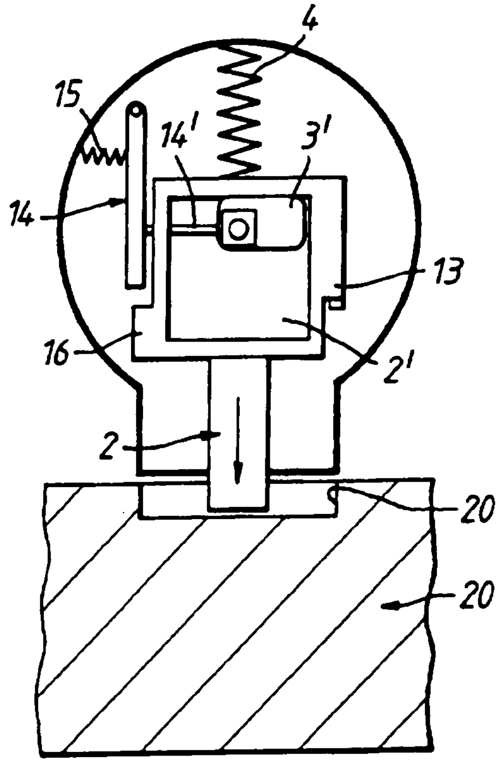

Fig.2

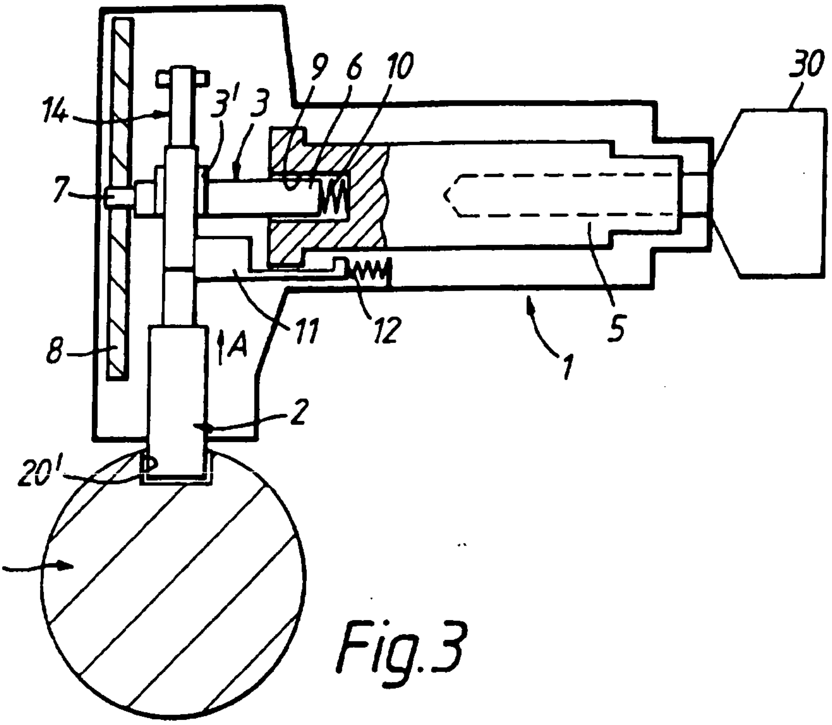

Fig.3

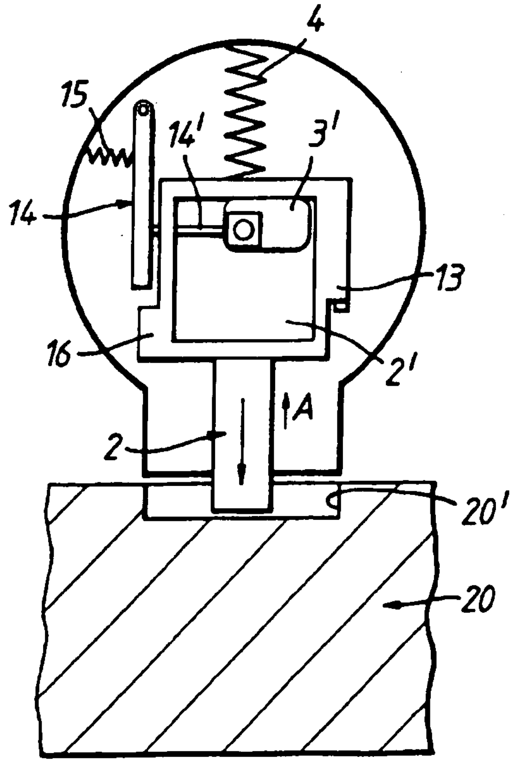

Fig.4

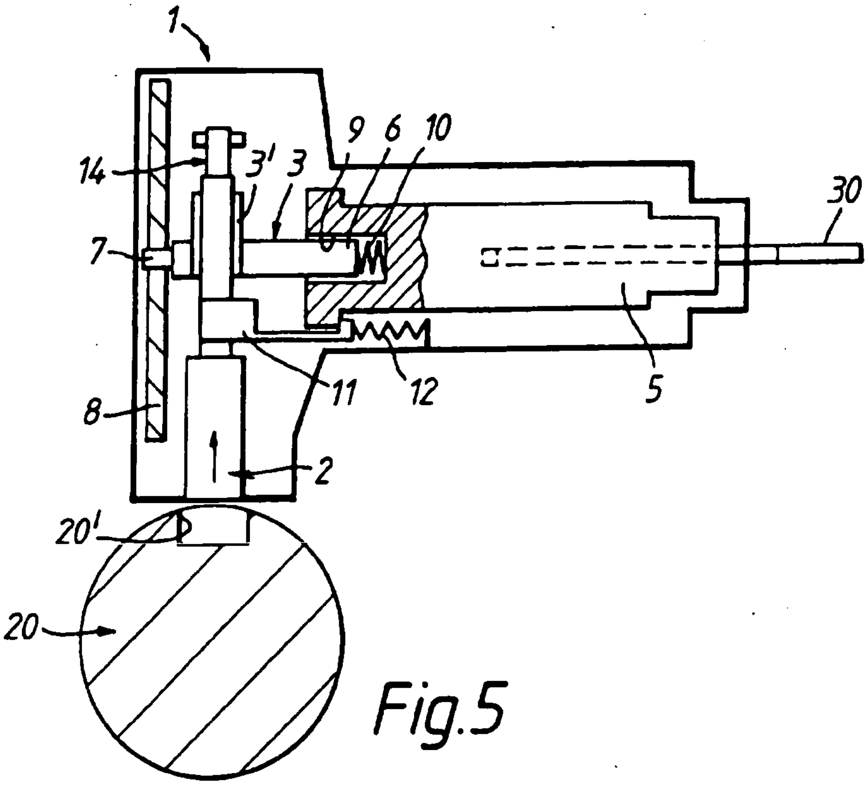

Fig.5

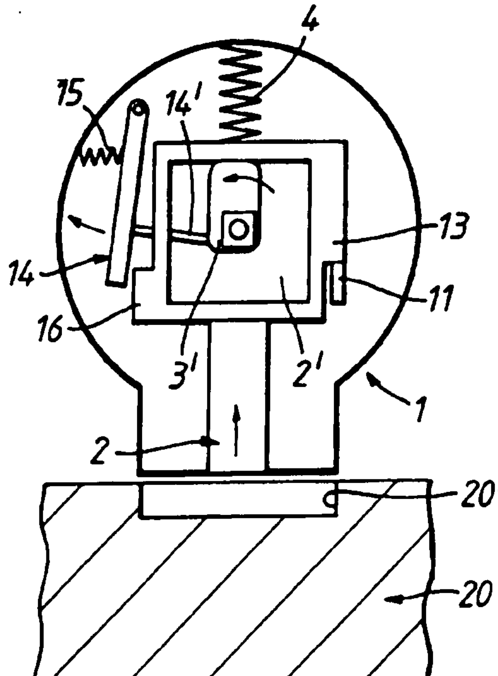

Fig.6

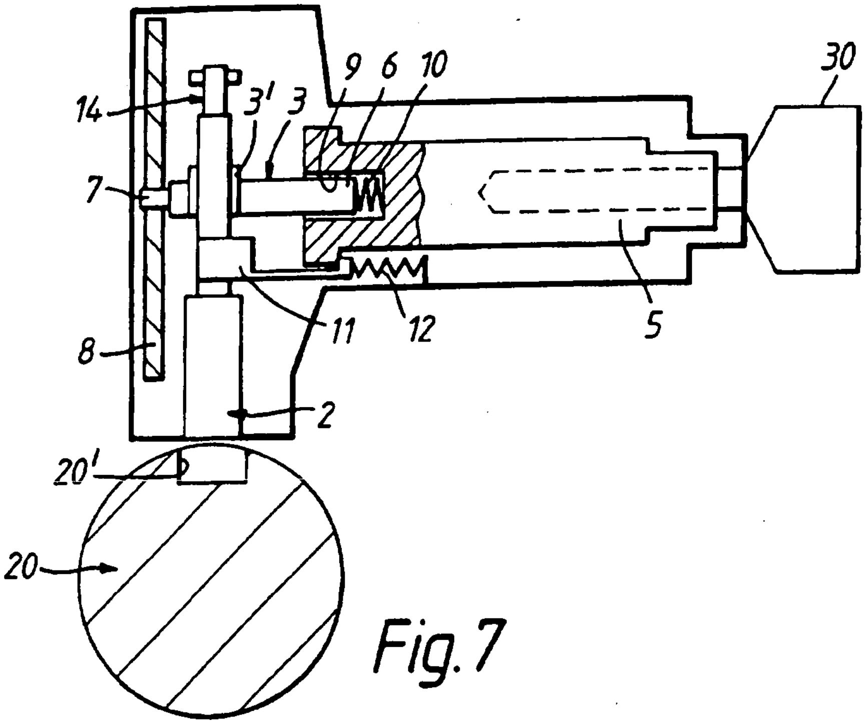

Fig. 7

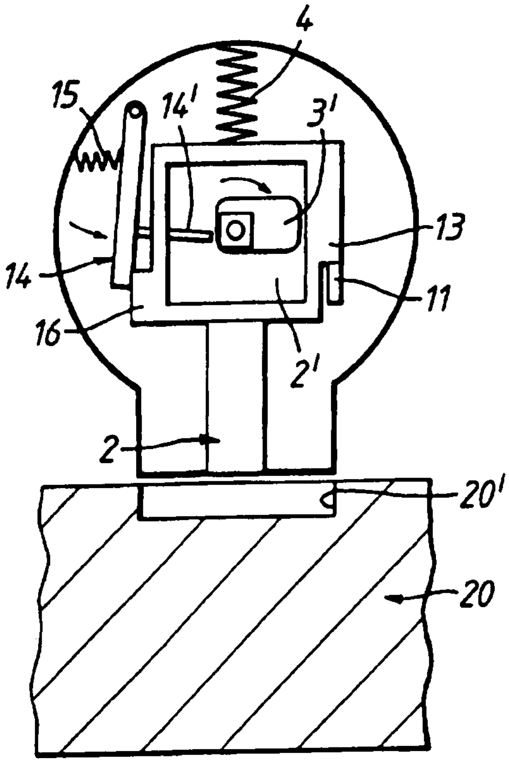

Fig. 8

A LOCK

The present invention relates to a lock which incorporates a locking bolt that is withdrawn by rotation of an operating key, in particular a steering column lock for a motor vehicle.

One form of steering column lock for a motor vehicle operates by engaging a locking bolt in an axial slot defined in the shaft of the steering column on withdrawl of an operating key, usually the ignition key of the vehicle. This engagement of the locking bolt in an axial slot prevents rotation of the shaft to which the steering wheel is attached, and thus acts as an "anti-theft" mechanism.

However, certain designs of steering column lock, generally those in which the lock barrel is displaced axially on key insertion, can be readily defeated. Such steering column locks can be defeated by inserting any key or blade type implement into the lock barrel in order to displace it axially, and then striking the lock body or steering wheel in a direction parallel to the axial direction of the engaged locking bolt. The striking of the lock body or steering wheel induces inertial forces within the bolt and causes the locking bolt to retract and become disengaged from the axial slot. This is referred to as "shock retraction", and once so disengaged the locking bolt will remain disengaged allowing the vehicle to be steered.

The aim of the present invention is to provide a lock which cannot be defeated by shock retraction, thereby offering enhanced security over the known prior art locks. In the present invention, shock retraction of the locking bolt is prevented by employing a mechanism which does not allow the forced displacement of the locking bolt.

The present invention provides a lock, comprising: an axially displaceable locking bolt; a lock barrel which receives an operating key; a cam unit, said cam unit being rotationally coupled to the lock barrel and operable so as to displace the locking bolt between a retracted and an extended position; and an anti-shock retraction member operable to engage the locking bolt to prevent the forced displacement of the locking bolt in the direction of retraction, said member being operably coupled to the lock barrel.

A preferred embodiment of the present invention will now be described hereinbelow by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a part-sectional longitudinal view of a steering column lock in accordance with an embodiment of the present invention, shown in the locked mode;

Figure 2 is a view from one end with back plate removed of the steering column lock in the locked mode shown in Figure 1;

Figure 3 is a part-sectional longitudinal view of the steering column lock, shown in the mode where an operating key is inserted in the lock barrel which is in a first neutral position;

Figure 4 is a view from one end with back plate removed of the steering column lock in the mode shown in Figure 3;

Figure 5 is a part-sectional longitudinal view of the steering columm lock, shown in unlocked mode;

Figure 6 is a view from one end with back plate removed of the steering column lock in the unlocked mode shown in Figure 5;

Figure 7 is a part-sectional longitudinal view of the steering column lock in the mode where the ignition switch has been returned to the neutral position with key inserted; and

Figure 8 is a view from one end with back plate removed of the steering column lock in the mode shown in Figure 7.

A steering column lock for a motor vehicle in accordance with a preferred embodiment of the present invention, and its sequence of operation, is illustrated in

Figures 1 to 8.

The steering column lock is housed in a main lock body 1 and incorporates a locking bolt 2 which is adapted to engage in an axial slot 20′ defined in the shaft 20 of a steering column (not shown) upon withdrawl of an operating key 30. The locking bolt 2 is displacable along its axis from an engaged or extended position (as shown in Figures 1 to 4) to a retracted position (as shown in Figures 6 to 8), and vice versa. One end of the locking bolt 2 has an opening 2′ defined therein in which a cam 3′ of a cam unit 3 is located. The locking bolt 2 is biassed in the direction of extension and against the cam 3′ by the action of a locking bolt return spring 4. It will be noted that the locking bolt return spring 4 has, for clarity, been omitted from the longitudinal views in the drawings. In this embodiment, the locking bolt 2 is moved from the retracted to the extended position by rotation of the cam 3′ through 90° in a counter-clockwise direction, and returned to the retracted position on rotation of the cam 3′ through 90° in the opposite, that is clockwise, direction.

The shaft of the cam unit 3 is connected at one end 6 in rotation with a lock barrel 5 and coupled rotatably at the other end 7 to a static back plate 8. For clarity, the back plate 8 is not shown in the end views in the drawings. The said one end 6 of the shaft of the cam unit 3 is located in axial slidable fit within an opening 9 defined in one end of the lock barrel 5, and a barrel return spring 10 is provided in the opening 9 to bias the lock barrel 5 in a direction away from the fixed back plate 8. The other end of the lock barrel 5 has an opening defined therein in which the operating key 30 is located. Preferably, the lock barrel 5 is of a conventional type comprising a plurality of tumblers and connected to the cam unit 3 by a square sectioned sliding joint. Rotation of the lock barrel 5 using the operating key causes rotation of the cam unit 3 to which it is connected, and the camming action of cam 3′ brings about the retraction and extension of the locking bolt 2.

The lock also includes a bolt release plunger 11 which is biassed towards the locking bolt 2 by a bolt release plunger spring 12 and which is adapted to engage with a first projection 13 on the locking bolt 2. The operation of the bolt release plunger 11 will be described further hereinbelow.

The steering column lock further includes an anti-shock retraction mechanism for preventing the shock retraction of the locking bolt 2 when engaged in a slot defined in the shaft of a steering column. In this embodiment, the anti-shock retraction mechanism comprises a pivotal lever 14. The lever 14 has an extending arm 14′ which rides on the cam 3′ and which is biassed against the cam 3′ by a lever spring 15. Alternatively, the arm 14′ may engage a further cam provided on the cam shaft. This anti-shock retraction mechanism operates such that when the lock barrel 5 is in a first neutral position, a free end of the lever 14 is positioned axially adjacent a second projection 16 on the locking bolt 2 in the direction of retraction, and thus will prevent the forced retraction of the locking bolt 2. When the lock barrel 5 is rotated using the correct operating key, the free end of the lever 14 moves away from the second projection 16 so as to permit retraction of the locking bolt 2. The operation of the anti-shock retraction mechanism will be described further hereinbelow.

Figures 1 and 2 illustrate the steering column lock in locked mode. The lock barrel 5 is in a first rotationally neutral position with no operating key inserted therein. In this mode, the locking bolt 2 is engaged under the action of the bolt return spring 4 in an axial slot 20′ defined in the shaft 20 of a steering column. This is the normal "anti-theft" mode where rotation of the steering wheel, which is attached to the shaft 20, is not possible. The bolt release plunger 11 is held in a retracted position by the lock barrel 5, which is axially displaced away from the cam 3′ under the action of the barrel return spring 10, and the bolt release plunger spring 12 is in a compressed state.

Figures 3 and 4 show the steeing column lock in a mode where an operating key 30 is inserted in the lock barrel 5 and the lock barrel 5 is in the rotationally neutral position. In this mode, the lock barrel 5 is axially displaced towards the back plate 8 and is held in that position by an escapement mechanism (not shown) which compreses the barrel return spring 10. The bolt release plunger 11 is unequally axially displaced in relation to the axial displacement of the lock barrel 5 owing to contact with the locking bolt 2. It is in this mode that deficiencies occur in the known steering locks. In the known steering locks, a sharp blow to the lock body in a direction contrary and axially parallel to the engaged position of the locking bolt 2 (shown by arrow A in Figures 3 and 4) causes the locking bolt 2 to retract. The locking bolt 2 once so retracted would remain in the retracted position. This is because when the locking bolt 2 is forced to the retracted position the bolt release plunger 11 would be displaced under the action of the bolt release plunger spring 12 to a position against the first projection 13 and thus prevent its return to the engaged position. In this embodiment, this forced or shock retraction is prevented by the provision of the lever 14 which acts to stop the locking bolt 2 from retracting sufficiently in this mode for the bolt release plunger 11 to engage with the first projection 13 on the locking bolt 2 and maintain the locking bolt 2 in the retracted position.

Figures 5 and 6 illustrate the steering column lock in a mode in which starting and steering of the vehicle to which it is attached are permitted. In this mode, the lock barrel 5 and cam unit 3 which is connected in rotation therewith have been rotated through 90° in a counter-clockwise direction. This rotation of the lock barrel 5 to a second position has resulted in the retraction of the locking bolt 2 to permit steering of the vehicle and would also have operated an ignition switch (not shown) which is driven by a cam on the cam unit 3. This retraction of the locking bolt 2 results in compression of the bolt return spring 4. In this mode, the anti-shock retraction lever 14 has been oriented so as to permit retraction of the locking bolt 2. Rotation of the lever 14 has been effected by the camming action of the extending arm 14′ of the lever 14 on the cam 3′. The arm 14′ preferably extends orthogonally. This rotation of the lever 14 results in compression of the lever spring 15. The bolt release plunger 11 has also been axially displaced under the first projection 13 on the locking bolt 2 by the action of the bolt release plunger spring 12.

Figures 7 and 8 illustrate the lock in a mode where the lock barrel 5 has been rotated in a clockwise direction back to the first neutral position. In this mode, the ignition switch (not shown) would have been switched off, but the locking bolt 2 remains retracted by the action of the bolt release plunger 11 under the first projection 13 on the locking bolt 2. This feature of maintaining the locking bolt 2 in retracted position when the lock barrel 5 has been returned to the neutral or off position is an essential safety device required by legislation. If this feature were not present, the locking bolt 2 would under the action of the locking bolt return spring 4 return to its extended position, that is be engaged in the axial slot 20′ defined in the shaft 20 of the steering column, and a driver, who had rotated the lock barrel 5 to the neutral position while the vehicle was in motion (e.g. to "coast"), would be in the extremely dangerous situation of being unable to steer the vehicle. It is only upon withdrawl of the operating key 30 from the lock barrel 5 that the lock barrel 5 is axially displaced by the action of the barrel return spring 10 to its original position (as shown in Figure 1). This axial displacement of the lock barrel 5 withdraws the bolt release plunger 11, causing the locking bolt 2, driven by the bolt release return spring 4, to engage in the axial slot 20′ in the shaft 20 of the steering column and thus return the steering column lock to its "anti-theft" mode.

It will be understood that the present invention is not limited to the use of a pivotal lever as the anti-shock retraction mechanism, but that any mechanism can be employed which permits normal use of the locking system and yet prevents the forced retraction of the locking bolt.

CLAIMS:

1. A lock, comprising: an axially displaceable locking bolt; a lock barrel which receives an operating key; a cam unit, said cam unit being rotationally coupled to the lock barrel and operable so as to displace the locking bolt between a retracted and an extended position; and an anti-shock retraction member operable to engage the locking bolt to prevent the forced displacement of the locking bolt in the direction of retraction, said member being operably coupled to the lock barrel.

2. A lock as defined in claim 1, wherein said cam unit is rotatable between a first and a second position, said locking bolt being in the extended position when said cam unit is said first position and in the retracted position when said cam unit is in said second position.

3. A lock as defined in claim 1 or claim 2, wherein said cam unit is located in an opening defined at one end of the locking bolt, and a cam thereof rides against a part of the opening.

4. A lock as defined in any one of claims 1 to 3, further comprising a first resilient element which biasses said locking bolt in the direction of extension.

5. A lock as defined in any one of claims 1 to 4, wherein one end of the shaft of said cam unit is located in axial slidable fit within a shaft opening defined in an end of said lock barrel.

6. A lock as defined in claim 5, wherein said one end of the cam shaft and said shaft opening are of square section.

7. A lock as defined in claim 5 or claim 6, further comprising a second resilient element which is located in said shaft opening and which biasses said cam unit and said lock barrel in opposed directions.

8. A lock as defined in any one of claims 5 to 7, wherein the other end of the cam shaft is rotatably coupled to a fixed plate.

9. A lock as defined in any foregoing claim, wherein a part of said anti-shock retraction member is located axially adjacent a first projection on the locking bolt in the direction of retraction when said locking bolt is in the extended position.

10. A lock as defined in claim 9, wherein said member comprises a pivotal lever a free end of which is located axially adjacent said first projection when said locking bolt is in the extended position.

11. A lock as defined in claim 10, wherein said pivotal lever includes a part which rides on said or other cam of said cam unit and said free end of the lever is moved to or away from said first projection on rotation of the cam unit.

12. A lock as defined in claim 11, wherein said part is an extending arm.

13. A lock as defined in claim 11 or claim 12, further comprising a third resilient element which biasses said pivotal lever against said or other cam.

14. A lock as defined in any foregoing claim, further comprising a bolt release plunger which is adapted to maintain the locking bolt, once retracted, in the retracted position until the operating key is withdrawn from the lock barrel.

15. A lock as defined in claim 14, wherein the bolt release plunger engages a second projection on the locking bolt.

16. A steering column incorporating a lock as defined in any foregoing claim, wherein said locking bolt engages a steering column shaft.

17. A lock substantially as hereinbefore described with reference to the accompanying drawings.

The Patent Office

Application No: GB 9503606.7
Claims searched: 1-17

Examiner: R.A.Short
Date of search: 6 March 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): E2A (AARQ,ACCB,ABM);B7J (J101E2C).

Int Cl (Ed.6): E05B and B60R.

Other: Online:WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 1,373,899 A (ARMAN) note lever 54.	-

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family
A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

An Executive Agency of the Department of Trade and Industry